A living lab

designed for early-adopters to experience novel technologies, to produce technological performance and user behaviour data, through a community of autarchic residences via a water, waste and energy box/hub

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Abstract

This project is focused on providing movable-temporary sustainable housing at derelict locations in cities, for young people / graduates / singles / expats / professionals in the European market. The goal is to act as the missing link between innovative small and medium enterprises in the sustainability and energy efficient sector (SME's) and their target audiences i.e. residences. It is a new housing concept that provides residential solutions and living lab facilities for innovative energy technologies. It is a solid quality solution at affordable rental price, at central locations inside cities providing independent living. At the same time, it provides a low cost living lab facility for field testing, linking to market and showcasing to innovative companies which want to "market test" their products and produce performance data. The ultimate goal is to influence user behavior via water, waste and energy autarchic community, in different levels, than later on the same principles can be applied in other residential, commercial or industrial district arrangement.

Keywords

living lab; autarchy; temporary building; residential community; SME; sustainability; energy efficiency; housing concept; innovation; energy technology; field testing; performance data; user behaviour

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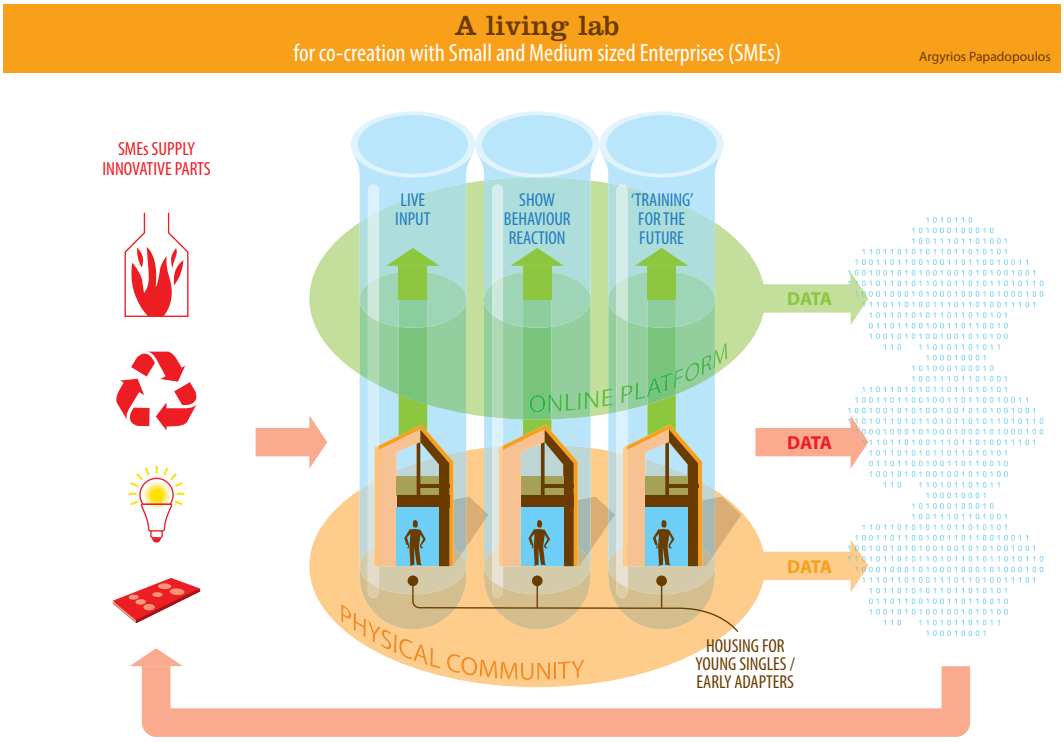

FIGURE 1 Graphical abstract

The demand for single person, affordable and private residential housing has been increasing for the last few years. This problem will be intensified as 2020 is approached and the demand for low energy consumption houses is rising. On the other hand, a rapidly growing demand for living labs by innovative small and medium enterprises has been observed which want to test and showcase their proven product. At the current state, an investment for living labs from them may not economically feasible. Finally, a lot of waste is generated in cities that is thrown away unexploited.

This living lab provides a combined solution, introducing an aesthetically pleasing, low production cost temporary house that, through energy production from PV installations, allows for lower rent, making it more affordable for potential customers. Also, innovator companies through a cost effective way will be allowed to test and showcase their new technological solutions while getting reviews and suggestions from the residents concerning the performance of their product. Moreover, they get a first link to the market in an environmentally friendly environment with low risk for their company image if the product doesn't perform well, since the tenants and clients sign a contract where accountability and liability are clearly mentioned.

Two market segments are targeted with a hybrid business which combines a service and a product, in one package. The first target market is young people who just started their career and are not able to buy their own house, they don't want to commit themselves to a permanent residence yet, they demand freedom, quality and independency. The second target market is small and medium companies (SME's) which can benefit from accessing the service offered by living labs.

The technologies applied at the living lab are in two different conceptual levels, building and district scale level. The goal is to make the residences autarchic in terms of energy, waste and possibly water demand, and to do so, different living labs have a different level of autarchy. For example, at building level autarchic buildings, each building has installed technologies that get each building closer to autarchy.

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However, this might be costlier when more buildings are located next to each other, compared to a centralized system of installations in an energy box or energy hub, attached to the building, with energy producing (CHP plant with biogas, biomass, waste or other fuel and an absorption chiller), energy storage (electrical, thermal or chemical), energy distribution/transformation (electricity, hot/cold water, inverter) capabilities and finally water storage and treatment for a closed water circle. Therefore, interior usable space of the residences is maximized and the buildings become autarchic in a higher level. A third living lab is similar to the aforementioned, with the addition of connecting the energy box/hub to nearby attached buildings and selling excess hot/cold water and electricity produced to them at competitive rates, turning it into a viable business model to invest in. In all cases, the users of the building are operating the technologies, with the option of providing the biomass fuel, possibly coming from organic waste (possibly for gasification), training them to comprise the future "net-not generation" (off grid).

To conclude, the expected result should be that residents of this housing will have the opportunity to experience and test novel sustainable technologies, and provide feedback to the technological designers through an online community platform. Another problem that can be tackled this way is waste in cities that is not utilized. This way, the people living there are going to co-create the transition to sustainable energy and behavior, "trained" to comprise the future "Net-not generation".

Support

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